29. A method according to claim 1 in which the cracking is carried out in a riser cracking zone.

30. A method according to claim 11 in which the heavy hydrocarbon oil feed comprises a vacuum gas oil.

A3

31. A method according to claim 11 in which the cracking is carried out in a riser cracking zone.

**Remarks**

1. This is in response to the Office Action of 17 December 1998.

2.1. The Examiner has made a restriction requirement between the claims of Group I (Claims 10-19, drawn to a method) and Group II (claims 20-27 drawn to a catalyst). The restriction requirement is justified apparently on the grounds that the method of claims 1-19 for using the catalyst can be practiced with another materially different product or that the catalyst as claimed can be used in a materially different process.

2.2. The Examiner has asserted that in the present case the product as claimed can be used in a materially different process and has referred to a molecular sieve. Interpreting this as a materially different process from the one claimed in claims 1-19, it is permitted that the Examiner has indulged in speculation which is not warranted by any evidence of record. There is no substantial evidence in the present record which shows that the claimed catalyst can be used in any different process or, at least, in any different process with any expectation of a useful result. Since, therefore, there is nothing to warrant the Examiner's speculation, it is submitted that adherence to the regulatory prescription should be determined by the evidence of record in the present file rather than on the mere assertion. With no evidence of record to support the Examiner's restriction requirement, it should be withdrawn.

2.3. The election of the method claims is affirmed.

3.1. The Examiner has made a requirement that the specification should be amended to include material incorporated by reference from a publication. The material in question is the referenced passage from the review by Venuto (page 5, lines 6-7) as well as similarly referenced passages from the handbook by Sadeghbeigi, page 5, lines 7-8 and the passages from the technical literature referred to on pages 7 and 13. While applicant has no objection in principal to the incorporation of the passages from these works (at the expense of making the specification considerably longer), it is submitted that it is not necessary to do this because the material referred to is not, in fact, essential. Certainly, the Examiner has failed to demonstrate that it is "essential".

3.2. The term "essential" refers to the compliance of the specification with the requirement of 35 U.S.C. 112, principally the requirement for an enabling disclosure (35 U.S.C. 112, first paragraph) or for a description of the best mode (35 U.S.C. 112, second paragraph). Although the Examiner has not indicated which of these two statutory requirements is considered to be implicated here, it is assumed that the requirement of an enabling disclosure is the one in point. The Examiner is, however, wrong in alleging that the disclosures incorporated by reference are essential for the disclosure to be enabling for a person or ordinary skill in this art. The skilled person in this art is well aware of the types of zeolitic catalytic materials used in FCC catalysts because they have been described in numerous publications and an extraordinarily large number of patents as well as in the brochures of catalyst manufacturers such as the Davison Division of W. R. Grace Company. The contents of these publications and patents will be well within the normal skill of the research worker in FCC technology and such a worker would not be dependent upon the disclosures in the two publications referred to on page 5 of the specification. Thus, the specification would be adequate even without these references. They do provide a useful reference point for entering the technical literature (as distinct from the patent literature) and for this reason they were given in the original specification.

3.3. It is noted that the Examiner has not asserted that any aspect of the specification is deficient in the absence of this material and has singularly failed to point out what the person of ordinary skill would need from these disclosures and to what end he would apply

the teachings of these disclosures. In the absence of a specific and identified deficiency of this kind, it is believed again that the Examiner's rejection is speculative and without substantive merit.

3.4. It is apprehended that reference to publications may properly be made in patent specifications without raising objections under 35 USC 112. Here, for example, the Examiner has not raised any objection to the citation of the three literature references on pages 8 and 10 of the description but the basis for selecting the other references as objectionable has not been explained nor reasons given for what appears to be an arbitrary selection.

3.5. The Examiner's objection is therefore considered to be without substantive merit and to be expressed without the clarity required by 37 CFR 1.104(a)(2). Withdrawal of this objection is therefore requested.

4. The Examiner has rejected claims 1-19 under 35 U.S.C. 112, second paragraph as being indefinite in their use of the term "elevated temperature", stating that the word "elevated" is considered to be relative term. Applicants do not concur with the Examiner's rejection on the grounds that the person of skill in the art of FCC technology would apprehend that the temperatures typically used in the catalytic cracking process are significantly above ambient temperature and can therefore properly be regarded as "elevated". Claims 1 and 11 have, however, been amended to specify that the catalytic cracking method is carried out under catalytic cracking conditions which include elevated temperature, so making it clear that the temperatures which are used are those appropriate to catalytic cracking, which are well understood and known to persons working with FCC technology.

5.1. The Examiner has rejected claims 1-19 under 35 U.S.C. 102(b) or 35 U.S.C. 103(a) as obvious over the disclosure in Collins, et al. U.S. 5,482,617.

5.2. As the Examiner has noted, Collins deals with a desulfurization process for a catalytically cracked feed stream which may be derived from an FCC process (Paper no. 5,

page 6). In the Collins process, the low boiling range feed which contains organic sulfur compounds is contacted with a catalyst in a fixed fluidized bed at elevated temperatures in th range of 700 to 850° F (column 2, lin 30-36; column 4, lines 4-5. The d sulfurized product is a gasoline range material, as noted at column 5, line 2. The catalyst used in the Collins process is an acidic zeolite such as ZSM-5 (intermediate pore size), or zeolite Y or zeolite beta (both large pore size materials). These zeolites may be employed in their acid forms or iron exchanged or impregnated with one or more suitable metals including zinc, nickel, cobalt and metals of other groups of the Periodic Table (column 5, line 29-42).

5.3.1. Two principal distinctions may be noted between the Collins process and the present catalytic cracking method. First, Collins uses a low boiling range feed which is distinct from the heavy oil feed used in the catalytic cracking process of the present invention. As the Examiner has noted (Paper No. 5, page 6), the Collins feed is a catalytically cracked feed stream derived from an FCC process; in other words, it is the *product* of a catalytic cracking process rather than the heavy oil *feed* which goes into a catalytically cracking process. Examples of feeds which may be used in the Collins process include catalytically cracked naphthas, pyrolysis gasoline, coker gasoline, FCC gasoline, reformate and thermally cracked pyrolysis and/or coker fractions (column 2, lines 37-47). Examples in the specification include naphtha and a heart-cut reformate with an end point of 190°F (88°C). The highest boiling point encountered in the examples is the 430°F (221°C) for the full range FCC naphtha (Table 4, Example 6).

5.3.2. Second, the Collins process is not a catalytic cracking process. This is made clear by the disclosure in Collins which states the following:

> The reactor and regenerator operating temperatures are mild compared to FCC conditions. Expensive alloys or refractory linings are not required in the design. Operating pressure is designed to be compatible with existing FCC unsaturated gas plant pressure. Direct transfer of FCC offgas to the unit of the present invention is preferred, avoiding the added cost of a compressor. FCC offgas needs only to go through a fuel gas amine contactor to remove hydrogen sulfide. (Column 7, lines 1-9).

Reference to the Examples shows that the typical range of temperatures encountered in the Collins process is 750 to 850°F (400 to 455°C) which is below the range of temperatures encountered in catalytic cracking operations.

5.4. It is submitted that the claims as filed adequately distinguish the present process from the disclosure in the Collins reference since both claims 1 and 11 specifically refer to the operation as being one of catalytic cracking, thereby implying all the conditions and parameters appropriate to that process which, as Collins points out, is *not* a process of the kind disclosed in that reference. Further, both claims 1 and 11 refer to the fact that the feed is subjected to cracking and that the product of the process included cracking products. None of these features are found in Collins which, as just noted, does not describe a catalytic cracking process. Furthermore, note that claim 11 refers to the use of a heavy hydrocarbon feed, again emphasizing the distinction.

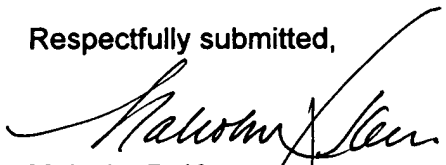
5.5. In order to emphasize the differences between the Collins process and the present process, claim 1 has been amended to refer to the use of a heavy hydrocarbon oil feed and to the fact that the feed is cracked to lighter liquid cracking products which are reduced sulfur content. These amendments are based on the original disclosure at page 5, lines 11 to 12 and page 5, line 18. It is therefore submitted that the claims as filed and in their present form are not disclosed in the Collins disclosure. The same applies to new claims 28 through 31 which refer to the use of feeds (vacuum gas oil) which are not disclosed in Collins and to the manner of cracking operation (riser cracking) which is also not disclosed in Collins. Note that the feeds in the present examples were gas oil feeds (page 21, lines 28 to 29). The use of riser cracking zone is the most common expedient in FCC operations as currently practiced (page 5, lines 17 to 18).

5.6. As far as the question of obviousness over the Collins reference is concerned, it is believed that the present claims are not obvious in view of Collins because there is nothing in Collins which indicates that its prescriptions would be applicable to the more severe conditions encountered in catalytic cracking operations and with the heavy oil feeds characteristic of catalytic cracking. Sp cifically, the organic sulfur compounds which ar present in the high boiling feeds typically used in FCC e.g. vacuum gas oil, contain the

sulfur in the form of benzothiophenes, dibenzothiophenes and alkylated benzothiophenes which are more resistant to removal than the mercaptans and simple thiophenes present in the low boiling f eds such as those noted in Collins. Given that this refractory character of the sulfur compound in FCC feeds is well known, there is no reason why a skilled person would have thought that it would have been desirable to extend any potential of the Collins for desulfurization activity to the more severe conditions encountered in FCC with more refractory feeds. The present claims are therefore believed to be unobvious and therefore patentable over the Collins disclosure.

6. In view of the remarks and amendments set out above, reconsideration and withdrawal of the objections and rejections is requested.

Respectfully submitted,



Malcolm D. Keen
Attorney for Applicants
Registration No. 27,728
(703) 846-7795

Mobil Business Resources Corp.
Office of Legal Counsel
Intellectual Property Group
3225 Gallows Road
Fairfax, VA 22037

May 26, 1999